APPENDIX F

Results of 2-PHASE™ Extraction Pilot Test

RESULTS OF PILOT TEST STUDY
CHLOROFORM IN SUBSURFACE NEAR FORMER BUILDING 028J
HITACHI GLOBAL STORAGE TECHNOLOGIES, INC.
5600 COTTLE ROAD
SAN JOSE, CALIFORNIA

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1.0 INTRODUCTION

1.1 Objective of the Pilot Test

The objective of the pilot study was to obtain data to evaluate the effectiveness of a 2-PHASE™ Extraction system to remediate chloroform in the vadose and shallow saturated zones near the former Building 028J at the Hitachi GST facility (the "Site", see Figure 1). This evaluation was based on the extraction rates of both ground water and vapor, concentrations of volatile organic compounds (VOCs) (primarily chloroform) in the extracted water and vapor streams, the vacuum and hydraulic radii of influence for individual wells and the pilot system as a whole, and an estimate of the contaminant mass removed during the pilot study.

The data obtained from the pilot-scale study was used to quantitatively assess the effectiveness of a full-scale 2-PHASE™ Extraction system.

1.2 Scope of Work

To achieve the stated objective, ENVIRON performed the following activities:

1. Installed fifteen (15), 4-inch diameter 2-PHASE™ Extraction and monitoring wells (EW-1 through EW-15), screened in the vadose and saturated zones.

2. Conducted a pilot test, including measurement of system performance parameters.

3. Measured the vacuum radius of influence (ROI) and drawdown in the observation wells during the pilot test.

4. Collected and analyzed samples of the extracted vapor and ground water.

5. Calculated mass removal rates.

2.0 PILOT TEST SETUP AND OPERATIONS

2.1 Pre-Field Work Activities

Prior to the commencement of field activities, ENVIRON prepared a Site health and safety plan and obtained permits from the Santa Clara Valley Water District for the installation of extraction/monitoring wells EW-1 through EW-15. Figure 2 shows the site layout and Figure 3 shows the pilot test monitoring/extraction well locations.

2.2 Installation of Extraction and Observation Wells

From April 25 through May 1, 2007, under ENVIRON's direction, Gregg Drilling & Testing, Inc. of Martinez, California drilled and installed fifteen (15) wells, in the vicinity of former Building 028J at the Site (Figure 2). The wells were installed to depths between 37 and 38.5 feet below ground surface (bgs) and screened at intervals ranging between 16 and 38 feet bgs. Well construction details are shown in Table 1.

The borings were hand-augured for the first 5 feet and then drilled to their maximum depths with a truck-mounted hollow-stem auger drilling rig. The wells were constructed of 4-inch diameter Schedule 40 polyvinyl chloride (PVC) casing, with a 0.02 inch factory-slotted screened interval. The annular space between casing and borehole sidewall of the wells was filled with filter pack to approximately two feet above the screened interval, and the remainder of the annular space sealed with bentonite pellets, followed by a bentonite-cement grout seal to just below ground surface. Each well was completed above grade with four-foot by four-foot concrete pedestals surrounded by three (3) bollards to protect the wellhead. A locking well cap was installed on each well.

Soil cuttings generated from the well installation activities were contained in bins and transported under manifest by Denbeste on June 7, 2007 to Altamont Landfill in Livermore, CA.

2.3 System Setup and Installation

ENVIRON used a 2-PHASE™ Extraction unit for the pilot test activities at the Site. The blower package consisted of a 5 horsepower (hp) electric motor driven liquid ring blower with a pump-down vapor/liquid separator (knock-out tank). Additional equipment included a diesel-fueled generator for the electrical needs of the equipment, two 1,000-pound carbon vessels for the treatment of extracted vapor, a 6,900 gallon double-walled poly tank, and a 6,500 gallon poly Baker tank for the storage of extracted water. Drewelow Remediation Equipment, Inc. of Escondido, California was contracted to install the necessary piping, make the electrical connections, and equip each monitoring point with a dual-use monitoring/extraction well head allowing measurements of vacuum and depth to water.

2.4 System Operation, and Monitoring

The 2-PHASE™ Extraction pilot test was conducted from June 5 to June 9, 2007 by extracting from EW-4, EW-5, EW-9, and EW-10 in several combinations. The total pilot test runtime was approximately 99 hours. Daily operations are included in Appendix B.

ENVIRON was on-site to oversee the pilot testing, to record monitoring data, and to collect air and ground water samples for laboratory analysis. Generally two to three sets of vapor and groundwater samples were collected per day. In addition, water levels in the observation wells were collected twice per day. ENVIRON also monitored the temperature, vacuum, and pressure gauges on the 2-PHASE™ Extraction system for proper operation. Drewelow Remediation Equipment was on-site to operate and maintain the 2-PHASE™ Extraction unit. An isobutylene-calibrated photoionization detector (PID) was used to monitor the extracted vapors.

During the pilot test, twenty-four vapor samples were collected in Tedlar bags using a hand-operated pump and submitted to Calscience Environmental Laboratories, Inc., a California State-certified laboratory, for analysis. The analytical results were used to estimate contaminant removal rates and to facilitate full-scale remediation system design. Vapor samples were analyzed for VOCs using EPA Test Method TO-15.

Six groundwater samples were collected from the inlet to one of the holding tanks and submitted to Severn Trent Laboratories, Inc., a California State-certified laboratory, for analysis. The analytical results were used to estimate the contaminant removal rates and to provide information for full-scale design purposes. The water samples were analyzed for VOCs using EPA Test Method 8260B.

3.0 PILOT TEST RESULTS

3.1 System Performance

A 99-hour continuous 2-PHASE™ Extraction pilot test was conducted over a five day period starting on June 5, 2007. All recorded vacuum readings in observation wells are included in Table 2. Extraction rates and cumulative volumes for vapor and groundwater are presented in Tables 3 and 4, respectively.

In general, with one extraction well running (EW-5), the blower vacuum ranged from 17 to 19 inches of mercury (inches Hg) and the vapor flow rate ranged from 16-19 cubic feet per minute (cfm) with the pilot-scale unit. The vacuum at the extraction wellhead ranged from 65 to 75 inches of water (inches H2O) and the groundwater extraction rate was approximately 1 gallon per minute (gpm).

During a stepped vacuum test, three wells were deemed to be the maximum number of extraction wells that could be operated with the pilot test unit. In general, with three wells operating (EW-5, EW-9, and EW-10), the blower vacuum ranged from 10-12 inches Hg and the vapor flow rates ranged from 30-33 cfm. The vacuum at the extraction wellheads ranged from 30-50 inches H2O and the groundwater extraction rate was approximately 2.2 gpm.

The extracted vapors were treated by the two in-series activated carbon vessels prior to discharging to the atmosphere. A total of approximately 9,360 gallons of extracted water was stored temporarily in the on-site water tanks and transported to the International Business Machine (IBM) on-Site groundwater remediation system by vacuum truck on June 14, 2007.

3.2 Observation Well Measurements

Although measurements of vacuum influence in observation wells surrounding the extraction well did not show detectable vacuum propagation during the pilot test, it may be that running the system longer will result in vacuum influences in adjacent wells as a result of the additional dewatering and subsequent desiccation of the shallow groundwater zone.

By the end of the pilot test, the groundwater levels in the observation wells were down 0.42 to 0.88 feet from their pre-extraction levels and were continuing to drop indicating that the hydraulic influence of the extraction wells is significant and that dewatering the shallow groundwater zone to enhance vapor extraction is feasible. Depth to groundwater measurements are summarized in Table 5.

3.3 Extracted Soil Vapor Concentrations

Contaminant concentrations were measured at the inlet to the carbon vessels using a PID. Influent and effluent soil vapor samples were also collected and analyzed for VOCs using EPA Test Method TO-15 at a State certified laboratory. Twenty-four vapor samples were collected during the pilot test. The compound with the highest overall concentrations was chloroform.

A summary of soil vapor analytical results is presented in Table 6. The laboratory analytical reports for soil vapor samples are included in Appendix C.

3.4 Extracted Ground Water Concentrations

Influent groundwater samples were collected and analyzed for VOCs using EPA Test Method 8260B. Six groundwater samples were collected during the pilot test. VOCs detected in groundwater included chloroform and trichloroethene (TCE). Chloroform had the highest overall concentrations.

A summary of groundwater analytical results is presented in Table 7. The laboratory analytical reports for groundwater samples are included in Appendix C.

3.5 Mass Removal Estimate

During the pilot test, several parameters including flow rate, vacuum, pressure, temperature and VOC concentrations in the influent vapor stream were measured in the field. Influent vapor and groundwater samples were also collected for laboratory analysis. Field measurements, along with laboratory analytical results were used to estimate the total chloroform mass removed from the liquid and vapor phases.

Mass Removed in Vapor Phase

To estimate the mass of chloroform removed in the extracted vapors during the pilot test, vapor samples were collected for laboratory analysis, and parameters including flow rate were measured in the field. System parameters and chloroform vapor concentrations were assumed to be constant between measurements to estimate the mass removed from the vapor phase.

Chloroform mass removed in the vapor stream was calculated from the average concentration and cumulative volume over a given time interval according to the following generalized equation:

$$M = \left(\frac{C_1 + C_2}{2} \right) * (V_2 - V_1) \qquad \text{(Equation 1)}$$

Where:
M = Mass of chloroform removed
C_1 = Chloroform concentration at beginning of time interval
C_2 = Chloroform concentration at end of time interval
V_1 = Cumulative volume at beginning of time interval
V_2 = Cumulative volume at end of time interval

The total mass of VOCs removed during the pilot test was calculated by summing the masses of VOCs removed during each time interval. Based on this calculation, approximately 93.9 grams (0.207 pounds) of chloroform were removed from soil vapors during the 99-hour pilot test.

Table 8 summarizes the cumulative mass of chloroform removed via the vapor phase and chloroform mass removal rate during the pilot test. The mass removal rate was calculated by dividing the total chloroform mass removed by the total pilot test run time. Based on this calculation, approximately 22.8 grams (0.050 pounds) of chloroform were removed in the vapor stream per day during the 99-hour duration pilot test.

Mass Removed in Water Phase

The majority of VOCs are stripped from the liquid phase and transferred to the vapor phase during the 2-PHASE™ Extraction process. As a result, the amount of VOCs removed via the liquid phase is minimal. Groundwater samples were collected for laboratory analysis and parameters including flow rate were measured in the field during each extraction test to estimate the mass of VOCs removed. System parameters and groundwater concentrations were assumed to be constant between measurements.

Table 9 summarizes the cumulative mass of chloroform removed via the liquid phase and chloroform mass removal rate during the pilot test. Using Equation 1 and laboratory analytical results, the total mass of VOCs removed from the groundwater was calculated to be 4.2 grams (0.009 pounds). The mass removal rate in the water phase was calculated to be approximately 1.0 gram (0.002 pounds) of chloroform per day during the 99-hour duration pilot test.

4.0 CONCLUSIONS

Based on the results of the pilot test, 2-PHASE™ Extraction was determined to be a viable option at the Site. Water table drawdown was observed even at moderate groundwater extraction rates indicating the feasibility of dewatering the shallow groundwater zone to "open up" the capillary fringe zone for efficient vapor extraction. This demonstrates that the choice of 2-PHASE™ Extraction over traditional SVE was appropriate in this case.

The groundwater extraction rate operating three wells was approximately 1.8 to 3.1 gallons per minute. While operating one well the extraction rate was approximately 1.0 to 1.2 gallons per minute. Based on water level drawdown, it is not believed that these groundwater extraction rates will be sustainable; however, during initial startup of the full-scale system more wells will be operated, and therefore, initial groundwater extraction rates will likely be significant. As the system operates these extraction rates will likely decrease. ENVIRON recommends that a 20,000-gallon closed-top steel Baker tank be used during full-scale treatment to handle the initial groundwater extraction rates. The capacity of the IBM groundwater remediation system and the groundwater injection rates should be confirmed to ensure uninterrupted operation of the full-scale system.

Measurements of vacuum influence in observation wells surrounding the extraction did not show detectable vacuum propagation during the pilot test. A low capacity vacuum pump (like the 5 hp blower used during this pilot test) used in a moderately permeable aquifer produces a high water/air ratio. This is because a high water production (at least initially) is obtained from the formation, which causes the drop tube or "stinger" to be mainly filled with water, causing low airflow. The resulting high line loss due to the lifting of the water can cause, in turn, a low applied vacuum at the subsurface. This phenomenon would explain the low applied vacuums at the well heads, the low vapor flow rates, and the lack of vacuum influence on nearby wells. Vapor flow rates and vacuum at the well heads should significantly increase during full-scale operation.

A total of approximately 98.1 grams (0.261 pounds) of chloroform were removed from the formation during the pilot test. Influent vapor sampling results show concentrations of chloroform ranging from 16-39 ug/L, which are moderate, but exceed soil gas concentrations (up to 28 ug/L) previously identified, thus indicating that significant mass transfer from the water phase to the vapor phase is likely occurring. At these concentrations carbon usage is not expected to be excessive over the long-term, but treatment times may be longer than initially expected due to low removal rates. Operating more wells at an increased vacuum during the full-scale system operation should increase the mass removal rates.

Based on the pilot test, the full-scale system as designed should be sufficient to achieve the required vacuum and vapor and groundwater flow rates. Treatment time will need to be reevaluated upon startup and operation of the full-scale system.

TABLES

TABLE 1: GROUNDWATER EXTRACTION/MONITORING WELL CONSTRUCTION DETAILS
2-PHASE™ Extraction Pilot Test
Hitachi GST
5600 Cottle Road, San Jose, California

Well	Installation Date	Total Depth (feet bgs)	SWL [1] (feet bTOC)	Stinger Depth [2] (feet bTOC)	Casing Material	Casing Diameter	Screen Slot Size	Screened Interval (feet bgs)	Filter Pack Interval (feet bgs)
EW-1	4/26/2007	37.5	30.21	29.8	PVC	4"	0.020"	17.0 - 37.0	15.0 - 37.5
EW-2	4/24/2007	37.5	28.51	28.0	PVC	4"	0.020"	17.0 - 37.0	15.0 - 37.5
EW-3	4/27/2007	36.5	29.11	28.5	PVC	4"	0.020"	16.0 - 36.0	14.0 - 36.5
EW-4	4/24/2007	37.5	31.27	30.5	PVC	4"	0.020"	17.0 - 37.0	15.0 - 37.5
EW-5	4/27/2007	37.0	30.21	30.0	PVC	4"	0.020"	16.5 - 36.5	14.5 - 37.0
EW-6	4/25/2007	37.5	29.39	28.8	PVC	4"	0.020"	17.0 - 37.0	15.0 - 37.5
EW-7	4/30/2007	36.5	29.64	29.0	PVC	4"	0.020"	16.0 - 36.0	14.0 - 36.5
EW-8	4/26/2007	37.5	32.12	31.5	PVC	4"	0.020"	17.0 - 37.0	15.0 - 37.5
EW-9	5/1//2007	38.0	31.59	31.0	PVC	4"	0.020"	17.5 - 37.5	15.5 - 38.0
EW-10	4/26/2007	38.5	31.69	31.5	PVC	4"	0.020"	18.0 - 38.0	16.0 - 38.5
EW-11	4/30/2007	37.5	31.69	30.0	PVC	4"	0.020"	17.0 - 37.0	15.0 - 37.5
EW-12	4/23/2007	38.5	30.73	30.0	PVC	4"	0.020"	18.0 - 38.0	16.0 - 38.5
EW-13	5/1/2007	38.5	33.18	32.5	PVC	4"	0.020"	18.0 - 38.0	16.0 - 38.5
EW-14	4/30/2007	38.5	32.64	32.0	PVC	4"	0.020"	18.0 - 38.0	16.0 - 38.5
EW-15	4/25/2007	38.5	32.22	31.5	PVC	4"	0.020"	18.0 - 38.0	16.0 - 38.5

Notes:

[1] Static Water Level (SWL) measured on June 4, 2007 immediately prior to start of pilot test.

[2] The extraction straw or "stinger" is a 1" PVC tube that hangs inside the well through which the vacuum is applied. The depth of the stinger controls the extracted vapor/water ratio.

"feet bgs" = feet below ground surface

"feet bTOC" = feet below top of casing

TABLE 2: 2-PHASE EXTRACTION SYSTEM MEASUREMENTS
2-PHASE™ Extraction Pilot Test
Hitachi GST
5600 Cottle Road, San Jose, California

Date/Time	Vacuum at Blower Inlet (inches Hg)	Vacuum at Extraction Wellhead (inches Hg) EW-5	EW-9	EW-10	EW-4	Extracted Vapor Temperature (degrees F)	Extracted Vapor Flow Rate [1, 2] (cfm)	Cumulative Water Volume [3] (gallons)	Extraction Wells Opened	Comments
6/4/07 13:00	--	--	--	--	--	--	--	0	EW-5, EW-9	System start
6/4/07 13:30	nm	nm	nm	--	--	nm	25.6	40	EW-5, EW-9	
6/4/07 15:10	nm	nm	nm	--	--	nm	25.4	230	EW-5, EW-9	System shutdown - generator down
6/5/07 7:10	--	--	--	--	--	--	--	--	EW-5	System start
6/5/07 9:10	18	5.1	--	--	--	100.6	18.0	nm	EW-5	
6/5/07 9:20	14	4.0	2.9	--	--	111.0	25.0	420	EW-5, EW-9	
6/5/07 9:30	12	3.3	2.5	1.8	--	110.1	30.0	nm	EW-5, EW-9, EW-10	
6/5/07 9:50	8	2.2	1.1	1.1	1.6	110.0	42.0	450	EW-5, EW-9, EW-10, EW-4	No water from EW-4 and EW-10
6/5/07 10:50	12	3.6	2.6	2.4	--	115.1	31.0	570	EW-5, EW-9, EW-10	
6/5/07 11:45	12	nm	nm	nm	--	113.9	30.8	761	EW-5, EW-9, EW-10	
6/5/07 13:00	12	3.5	2.7	2.4	--	117.3	31.9	972	EW-5, EW-9, EW-10	
6/5/07 13:25	13	3.9	3.1	--	--	115.6	28.5	1,002	EW-5, EW-9	
6/5/07 13:55	13	4.0	3.2	--	--	114.8	28.4	1,090	EW-5, EW-9	
6/5/07 14:20	nm	nm	nm	--	--	nm	28.5	1,140	EW-5, EW-9	
6/5/07 14:40	18	5.1	--	--	--	107.7	19.3	1,170	EW-5	
6/5/07 15:40	18	5.0	--	--	--	107.1	19.5	1,230	EW-5	
6/5/07 16:40	18	5.1	--	--	--	104.0	18.7	1,318	EW-5	
6/6/07 7:00	17	5.4	--	--	--	94.8	18.3	2,296	EW-5	
6/6/07 10:00	17	5.1	--	--	--	97.4	18.8	2,480	EW-5	
6/6/07 11:30	17	5.2	--	--	--	99.1	18.7	2,560	EW-5	
6/6/07 12:15	nm	nm	--	--	--	nm	18.7	2,630	EW-5	System shutdown - change carbon
6/6/07 14:00	--	--	--	--	--	--	--	--	EW-5	System start
6/6/07 15:05	17	4.8	--	--	--	107.5	18.1	2,740	EW-5	
6/6/07 18:05	17	5.1	--	--	--	102.7	18.9	2,901	EW-5	
6/7/07 7:00	nm	nm	--	--	--	nm	nm	nm	EW-5	System shutdown - water in vapor line
6/7/07 7:05	--	--	--	--	--	--	--	--	EW-5	System start
6/7/07 8:05	18	4.1	--	--	--	98.5	18.4	3,760	EW-5	

TABLE 2: 2-PHASE EXTRACTION SYSTEM MEASUREMENTS
2-PHASE™ Extraction Pilot Test
Hitachi GST
5600 Cottle Road, San Jose, California

Date/Time	Vacuum at Blower Inlet (inches Hg)	Vacuum at Extraction Wellhead (inches Hg) EW-5	EW-9	EW-10	EW-4	Extracted Vapor Temperature (degrees F)	Extracted Vapor Flow Rate [1, 2] (cfm)	Cumulative Water Volume [3] (gallons)	Extraction Wells Opened	Comments
6/7/07 12:05	17	4.7	--	--	--	117.5	18.5	3,980	EW-5	
6/7/07 13:50	17	4.6	--	--	--	122.1	19.3	4,141	EW-5	
6/7/07 15:35	nm	nm	--	--	--	nm	19.1	nm	EW-5	
6/7/07 16:40	11	3.1	2.6	2.3	--	125.0	30.0	4,411	EW-5, EW-9, EW-10	
6/8/07 8:30	11	3.4	2.8	2.4	--	123.5	33.5	6,581	EW-5, EW-9, EW-10	
6/8/07 10:00	10	nm	nm	nm	--	nm	33.0	6,680	EW-5, EW-9, EW-10	
6/8/07 16:40	11	3.2	2.8	2.2	--	123.7	33.0	7,461	EW-5, EW-9, EW-10	
6/9/07 7:40	10.5	3.4	2.8	2.3	--	124.0	33.2	9,161	EW-5, EW-9, EW-10	
6/9/07 9:00	nm	nm	nm	--	--	nm	33.2	nm	EW-5, EW-9	
6/9/07 9:16	nm	nm	--	--	--	nm	24.5	nm	EW-5	
6/9/07 9:28	nm	nm	--	--	--	nm	19.9	9,360	EW-5	System shutdown

Notes:

[1] Vapor flow rate measured in cubic feet per minute (cfm) using a hotwire anemometer at the inlet to the first carbon vessel.

[2] Flow rates are assumed to be constant for the period between consecutive measurments.

[3] Volume of water extracted is measured with a totalizer on the outlet of the transfer pump.

"nm" = no measurement

"inches Hg" = inches of mercury

"degrees F" = degrees Fahrenheit

TABLE 3: VAPOR EXTRACTION RATES AND CUMULATIVE VAPOR VOLUME
2-PHASE™ Extraction Pilot Test
Hitachi GST
5600 Cottle Road, San Jose, California

Date/Time	Vapor Flow Rate [1, 2] (cfm)	Run-Time (minutes)	Vapor Volume (cubic feet)	Cumulative Run-Time (minutes)	Cumulative Vapor Volume (cubic feet)	Extraction Wells Opened	Comments
6/4/07 13:00	--	0	0	0	0	EW-5, EW-9	System start
6/4/07 13:30	25.6	30	768	30	768	EW-5, EW-9	
6/4/07 15:10	25.4	100	2,540	130	3308	EW-5, EW-9	System shutdown - generator down
6/5/07 7:10	--	--	--	--	--	EW-5	System start
6/5/07 9:10	18.0	120	2,160	250	5,468	EW-5	
6/5/07 9:20	25.0	10	250	260	5,718	EW-5, EW-9	
6/5/07 9:30	30.0	10	300	270	6,018	EW-5, EW-9, EW-10	
6/5/07 9:50	42.0	20	840	290	6,858	EW-5, EW-9, EW-10, EW-4	No water from EW-4 and EW-10
6/5/07 10:50	31.0	60	1,860	350	8,718	EW-5, EW-9, EW-10	
6/5/07 11:45	30.8	55	1,694	405	10,412	EW-5, EW-9, EW-10	
6/5/07 13:00	31.9	75	2,393	480	12,805	EW-5, EW-9, EW-10	
6/5/07 13:25	28.5	25	713	505	13,517	EW-5, EW-9	
6/5/07 13:55	28.4	30	852	535	14,369	EW-5, EW-9	
6/5/07 14:20	28.5	25	713	560	15,082	EW-5, EW-9	
6/5/07 14:40	19.3	20	386	580	15,468	EW-5	
6/5/07 15:40	19.5	60	1,170	640	16,638	EW-5	
6/5/07 16:40	18.7	60	1,122	700	17,760	EW-5	
6/6/07 7:00	18.3	860	15,738	1,560	33,498	EW-5	
6/6/07 10:00	18.8	180	3,384	1,740	36,882	EW-5	
6/6/07 11:30	18.7	90	1,683	1,830	38,565	EW-5	
6/6/07 12:15	18.7	45	842	1,875	39,406	EW-5	System shutdown - change carbon
6/6/07 14:00	--	--	--	--	--	EW-5	System start
6/6/07 15:05	18.1	65	1,177	1,940	40,583	EW-5	
6/6/07 18:05	18.9	180	3,402	2,120	43,985	EW-5	
6/7/07 7:00	nm	nm	nm	nm	nm	EW-5	System shutdown - water in vapor line
6/7/07 7:05	--	--	--	--	--	EW-5	System start
6/7/07 8:05	18.4	835	15,364	2,955	59,349	EW-5	
6/7/07 12:05	18.5	240	4,440	3,195	63,789	EW-5	

TABLE 3: VAPOR EXTRACTION RATES AND CUMULATIVE VAPOR VOLUME
2-PHASE™ Extraction Pilot Test
Hitachi GST
5600 Cottle Road, San Jose, California

Date/Time	Vapor Flow Rate [1, 2] (cfm)	Run-Time (minutes)	Vapor Volume (cubic feet)	Cumulative Run-Time (minutes)	Cumulative Vapor Volume (cubic feet)	Extraction Wells Opened	Comments
6/7/07 13:50	19.3	105	2,027	3,300	65,815	EW-5	
6/7/07 15:35	19.1	105	2,006	3,405	67,821	EW-5	
6/7/07 16:40	30.0	65	1,950	3,470	69,771	EW-5, EW-9, EW-10	
6/8/07 8:30	33.5	950	31,825	4,420	101,596	EW-5, EW-9, EW-10	
6/8/07 10:00	31.0	90	2,790	4,510	104,386	EW-5, EW-9, EW-10	
6/8/07 16:40	33.0	400	13,200	4,910	117,586	EW-5, EW-9, EW-10	
6/9/07 7:40	33.2	900	29,880	5,810	147,466	EW-5, EW-9, EW-10	
6/9/07 9:00	33.2	100	3,320	5,910	150,786	EW-5, EW-9	
6/9/07 9:16	24.5	16	392	5,926	151,178	EW-5	
6/9/07 9:28	19.9	12	239	5,938	151,416	EW-5	System shutdown

Notes:

[1] Vapor flow rate measured in cubic feet per minute (cfm) using a hotwire anemometer at the inlet to the first carbon vessel.

[2] Flow rates are assumed to be constant for the period between consecutive measurments.

"nm" = no measurement

TABLE 4: GROUNDWATER EXTRACTION RATES AND CUMULATIVE WATER VOLUME
2-PHASE™ Extraction Pilot Test
Hitachi GST
5600 Cottle Road, San Jose, California

Date/Time	Run-Time (minutes)	Cumulative Run-Time (minutes)	Water Volume (gallons)	Cumulative Water Volume (gallons)	Incremental Extraction Rate[1] (gpm)	Cumulative Extraction Rate[2] (gpm)	Effective Extraction Rate[3] (gpm)	Extraction Wells Opened	Comments
6/4/07 13:00	0	0	0	0	--	--	--	EW-5, EW-9	System start
6/4/07 13:30	30	30	40	40	1.3	1.3	--	EW-5, EW-9	
6/4/07 15:10	100	130	190	230	1.9	1.8	**1.8**	EW-5, EW-9	System shutdown - generator down
6/5/07 7:10	--	--	--	--	--	--	--	EW-5	System start
6/5/07 9:10	120	250	nm	nm	nm	nm	--	EW-5	
6/5/07 9:20	10	260	190	420	1.5	1.6	--	EW-5, EW-9	
6/5/07 9:30	10	270	nm	nm	nm	nm	--	EW-5, EW-9, EW-10	
6/5/07 9:50	20	290	30	450	1.0	1.6	--	EW-5, EW-9, EW-10, EW-4	No water from EW-4 and EW-10
6/5/07 10:50	60	350	120	570	2.0	1.6	--	EW-5, EW-9, EW-10	
6/5/07 11:45	55	405	191	761	3.5	1.9	--	EW-5, EW-9, EW-10	
6/5/07 13:00	75	480	211	972	2.8	2.0	**3.1**	EW-5, EW-9, EW-10	
6/5/07 13:25	25	505	30	1,002	1.2	2.0	--	EW-5, EW-9	
6/5/07 13:55	30	535	88	1,090	2.9	2.0	--	EW-5, EW-9	
6/5/07 14:20	25	560	50	1,140	2.0	2.0	--	EW-5, EW-9	
6/5/07 14:40	20	580	30	1,170	1.5	2.0	--	EW-5	
6/5/07 15:40	60	640	60	1,230	1.0	1.9	--	EW-5	
6/5/07 16:40	60	700	88	1,318	1.5	1.9	**1.2**	EW-5	
6/6/07 7:00	860	1,560	978	2,296	1.1	1.5	**1.1**	EW-5	
6/6/07 10:00	180	1,740	184	2,480	1.0	1.4	--	EW-5	
6/6/07 11:30	90	1,830	80	2,560	0.9	1.4	--	EW-5	
6/6/07 12:15	45	1,875	70	2,630	1.6	1.4	**1.1**	EW-5	System shutdown - carbon change
6/6/07 14:00	--	--	--	--	--	--	--	EW-5	System start
6/6/07 15:05	65	1,940	110	2,740	1.7	1.4	--	EW-5	
6/6/07 18:05	180	2,120	161	2,901	0.9	1.4	**1.1**	EW-5	
6/7/07 7:00	nm	nm	nm	nm	nm	nm	--	EW-5	System shutdown - water in vapor line
6/7/07 7:05	--	--	--	--	--	--	--	EW-5	System start
6/7/07 8:05	835	2,955	860	3,760	1.0	1.3	**1.0**	EW-5	

TABLE 4: GROUNDWATER EXTRACTION RATES AND CUMULATIVE WATER VOLUME
2-PHASE™ Extraction Pilot Test
Hitachi GST
5600 Cottle Road, San Jose, California

Date/Time	Run-Time (minutes)	Cumulative Run-Time (minutes)	Water Volume (gallons)	Cumulative Water Volume (gallons)	Incremental Extraction Rate[1] (gpm)	Cumulative Extraction Rate[2] (gpm)	Effective Extraction Rate[3] (gpm)	Extraction Wells Opened	Comments
6/7/07 12:05	240	3,195	220	3,980	0.9	1.2	--	EW-5	
6/7/07 13:50	105	3,300	161	4,141	1.5	1.3	**1.1**	EW-5	
6/7/07 15:35	105	3,405	nm	nm	nm	nm	--	EW-5	
6/7/07 16:40	65	3,470	270	4,411	1.6	1.3	--	EW-5, EW-9, EW-10	
6/8/07 8:30	950	4,420	2170	6,581	2.3	1.5	**2.3**	EW-5, EW-9, EW-10	
6/8/07 10:00	90	4,510	100	6,680	1.1	1.5	--	EW-5, EW-9, EW-10	
6/8/07 16:40	400	4,910	780	7,461	2.0	1.5	**1.8**	EW-5, EW-9, EW-10	
6/9/07 7:40	900	5,810	1700	9,161	1.9	1.6	**1.9**	EW-5, EW-9, EW-10	
6/9/07 9:00	100	5,910	nm	nm	nm	nm	--	EW-5, EW-9	
6/9/07 9:16	16	5,926	nm	nm	nm	nm	--	EW-5	
6/9/07 9:28	12	5,938	200	9,360	1.6	1.6	--	EW-5	System shutdown

Notes:

[1] The "Incremental Extraction Rate" is an estimated extraction rate for each time interval calculated from the Water Volume and Run-Time. During stable operation and for long time intervals with large water volumes, the Incremental Extraction Rate approaches the Effective Extraction Rate.

[2] The "Cumulative Extraction Rate" is the average extraction rate at any given interval calculated from the Cumulative Water Volume and Culmulative Run-Time.

[3] The "Effective Extraction Rate" is the extraction rate during stable operation (minimum 120 minutes uninterrupted operation with the same well(s) open).

"nm" = no measurement

"gpm" = gallons per minute

TABLE 5: WATER TABLE DRAWDOWN MEASUREMENTS
2-PHASE™ Extraction Pilot Test
Hitachi GST
5600 Cottle Road, San Jose, California

	Depth to Water (feet bTOC)															Cumulative Volume
Date/Time	**EW-1**	**EW-2**	**EW-3**	**EW-4**	**EW-5**	**EW-6**	**EW-7**	**EW-8**	**EW-9**	**EW-10**	**EW-11**	**EW-12**	**EW-13**	**EW-14**	**EW-15**	**Extracted [1]**
6/4/07 9:00	30.21	28.51	29.11	31.27	30.21	29.39	29.64	32.12	31.59	31.69	31.69	30.73	33.16	32.64	32.22	System Off
6/5/07 11:30	30.38	28.74	29.27	31.52	EX	29.71	29.75	32.26	EX	EX	31.88	30.81	33.41	32.81	32.29	750 gallons
6/5/07 14:30	30.43	28.78	29.29	31.58	EX	29.76	29.76	32.29	32.04	32.05	31.89	30.82	33.39	32.81	32.29	1,150 gallons
6/6/07 8:00	30.56	28.90	29.38	31.65	EX	29.83	29.83	32.34	31.96	32.05	31.92	30.87	33.42	32.85	32.34	2,300 gallons
6/6/07 12:25	30.57	28.91	29.41	31.65	31.03	29.85	29.85	32.36	31.95	32.04	31.95	30.89	33.43	32.85	32.39	2,630 gallons
6/6/07 13:05	nm	nm	nm	nm	30.76	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	System Off
6/6/07 17:40	30.57	28.91	29.39	31.68	EX	29.85	29.83	32.36	31.99	32.06	31.94	30.88	33.43	32.85	32.45	2,850 gallons
6/7/07 9:40	30.65	28.99	29.46	31.74	EX	29.92	29.89	32.49	32.04	32.12	32.00	30.93	33.49	32.91	32.40	3,800 galllons
6/7/07 15:00	30.66	29.00	29.47	31.75	EX	29.94	29.90	32.43	32.05	32.13	32.02	30.93	33.49	32.92	32.40	4,300 gallons
6/8/07 8:40	30.76	29.10	29.57	31.98	EX	30.13	30.01	32.67	EX	EX	32.26	31.06	33.85	33.19	32.56	6,500 gallons
6/8/07 16:50	30.78	29.13	29.59	32.03	EX	30.18	30.04	32.72	EX	EX	32.29	31.04	33.99	32.23	32.55	7,400 gallons
6/9/07 8:15	30.88	29.22	29.68	32.14	EX	30.27	30.12	32.84	EX	EX	32.40	31.19	34.03	33.35	32.64	9,200 gallons
6/9/07 9:30	nm	nm	nm	nm	31.47	nm	nm	nm	32.75	32.75	nm	nm	nm	nm	nm	System Off
Total	**-0.67**	**-0.71**	**-0.57**	**-0.87**	**EX**	**-0.88**	**-0.48**	**-0.72**	**EX**	**EX**	**-0.71**	**-0.46**	**-0.87**	**-0.71**	**-0.42**	**9,360 gallons**

Notes:

[1] "Cumulative Volume Extracted" is the approximate cumulative volume of water extracted based on readings from the totalizer at the outlet of the transfer pump.

"feet bTOC" = feet below top of casing

"EX" = Well used for extraction and water levels are the result of both drawdown and upwelling.

TABLE 6: SUMMARY OF CHEMICAL TEST RESULTS - VAPOR
2-PHASE™ Extraction Pilot Test
Hitachi GST
5600 Cottle Road, San Jose, California

Sample Name	Sample Location	Sample Date	Sample Time	Vapor Concentration (ug/L) [1, 2]																	
				Acetone	Benzene	2-Butanone	Carbon Disulfide	CT	Chloroform	1,1-DCA	1,1-DCE	MTBE	Total Xylenes	TBA	Toluene	PCE	TCE	TCFM	Freon 113	1,1,1-TCA	1,1,2-TCA
PT-C1IN-06052007-1105	C1 Influent	6/5/2007	11:05	0.028	ND	0.091	0.015	0.064	34	0.030	0.32	ND	ND	ND	ND	0.047	1.9	ND	0.33	0.85	ND
PT-C2EFF-06052007-1110	C2 Effluent	6/5/2007	11:10	0.018	ND	ND	ND	ND	ND	ND	ND	ND	0.0107	ND	0.0079	ND	ND	ND	ND	ND	ND
PT-AMB-06052007-1115	Ambient Air	6/5/2007	11:15	0.027	ND	0.0037	0.014	ND	ND	ND	ND	ND	0.0097	ND	0.0069	ND	ND	ND	ND	ND	ND
PT-C1IN-06052007-1400	C1 Influent	6/5/2007	14:00	ND	ND	ND	ND	ND	26	ND	0.52	ND	ND	ND	ND	ND	1.9	ND	0.45	0.45	ND
PT-C1IN-06052007-1640	C1 Influent	6/5/2007	16:40	0.030	ND	0.046	0.015	0.13	39	0.052	0.58	0.034	ND	ND	ND	0.038	2.9	ND	0.31	1.8	ND
PT-C1IN-06062007-0700	C1 Influent	6/6/2007	7:00	ND	ND	0.015	0.015	0.081	24	0.043	0.53	ND	ND	ND	ND	0.020	1.3	ND	0.21	0.97	ND
PT-C1IN-06062007-1130	C1 Influent	6/6/2007	11:30	0.024	ND	0.018	0.018	0.086	26	0.45	0.55	ND	ND	ND	ND	0.021	1.6	ND	0.20	0.97	ND
PT-C1EFF-06062007-1130	C1 Effluent	6/6/2007	11:30	0.026	ND	0.0029	0.017	ND	ND	ND	ND	ND	0.0025	ND	0.0054	ND	ND	ND	ND	ND	ND
PT-C1IN-06062007-1505	C1 Influent	6/6/2007	15:05	0.033	ND	0.26	0.022	0.087	24	0.047	0.54	ND	ND	ND	ND	0.023	1.5	ND	0.19	1.0	ND
PT-C1IN-06062007-1805	C1 Influent	6/6/2007	18:05	0.031	ND	ND	0.013	0.085	24	0.040	0.46	0.025	ND	ND	0.0036	0.026	1.2	0.012	0.15	0.88	0.0077
PT-C1EFF-06062007-1805	C1 Effluent	6/6/2007	18:05	0.048	ND	0.038	0.024	ND	ND	ND	ND	ND	ND	ND	0.044	ND	ND	ND	ND	ND	ND
PT-C1IN-06072007-0805	C1 Influent	6/7/2007	8:05	0.036	ND	ND	0.024	0.081	22	0.042	0.44	ND	ND	ND	ND	0.019	1.3	ND	0.14	0.90	ND
PT-C1IN-06072007-1205	C1 Influent	6/7/2007	12:05	0.061	ND	0.018	0.029	0.083	23	0.046	0.47	ND	ND	ND	ND	0.023	1.3	ND	0.15	0.95	ND
PT-C1EFF-06072007-1205	C1 Effluent	6/7/2007	12:05	0.039	0.0072	0.018	0.023	ND	ND	ND	ND	ND	0.068	ND	0.078	ND	ND	ND	ND	ND	ND
PT-C1IN-06072007-1350	C1 Influent	6/7/2007	13:50	0.12	0.018	0.027	0.053	0.074	19	0.041	0.46	ND	ND	0.042	0.13	ND	1.1	ND	0.15	0.84	ND
PT-C1EFF-06072007-1350	C1 Effluent	6/7/2007	13:50	0.069	0.0091	0.037	0.024	ND	0.61	ND	0.0034	ND	0.0212	ND	0.080	ND	0.087	ND	ND	0.14	ND
PT-C1IN-06072007-1640	C1 Influent	6/7/2007	16:40	0.065	0.075	0.024	0.021	0.047	23	0.027	0.25	ND	ND	ND	0.079	0.026	0.95	0.059	0.17	0.62	ND
PT-C1EFF-06072007-1640	C1 Effluent	6/7/2007	16:40	0.084	0.071	0.034	0.030	ND	0.56	ND	ND	ND	0.026	0.0063	0.099	ND	0.056	ND	ND	0.0091	ND
PT-C1IN-06082007-0830	C1 Influent	6/8/2007	8:30	ND	0.11	ND	ND	0.072	17	ND	0.23	ND	ND	ND	0.080	ND	1.1	ND	0.14	0.57	ND
PT-C1EFF-06082007-0830	C1 Effluent	6/8/2007	8:30	0.038	0.041	0.0067	0.0087	ND	0.13	ND	ND	ND	0.0121	ND	0.037	ND	0.014	ND	ND	ND	ND
PT-C2EFF-06082007-0830	C2 Effluent	6/8/2007	8:30	0.042	0.035	ND	0.023	ND	0.18	ND	ND	ND	ND	ND	0.032	ND	0.015	ND	ND	ND	ND
PT-C1IN-06082007-1640	C1 Influent	6/8/2007	16:40	0.034	0.063	ND	0.018	0.061	16	0.018	0.19	ND	ND	ND	0.049	0.019	0.93	0.067	0.10	0.45	ND
PT-C1EFF-06082007-1640	C1 Effluent	6/8/2007	16:40	0.046	0.059	0.013	0.011	ND	0.081	ND	ND	ND	0.0203	ND	0.055	ND	0.0096	ND	ND	ND	ND
PT-C2EFF-06082007-1640	C2 Effluent	6/8/2007	16:40	0.068	0.12	ND	0.030	ND	0.23	ND	ND	ND	0.0096	ND	0.083	ND	0.021	ND	ND	ND	ND

Notes:

[1] Only componds detected in the influent vapor stream are shown.

[2] Samples analyzed by Calscience Environmental Laboratories, Inc., of Garden Grove, California by USEPA Method TO-15.

"C1" = First carbon vessel.

"C2" = Second carbon vessel (connected in series).

ug/L = micrograms per litre

"ND" = Not detected

"CT" = Carbon Tetrachloride

"1,1-DCA" = 1,1-Dichloroethane

"1,1-DCE" = 1,1-Dichloroethene

"MTBE" = Methyl -t-Butyl Ether

"TBA" = Tert-Butyl Alcohol

"PCE" = Tetrachloroethene

"TCE" = Trichloroethene

"TCFM" = Trichlorofluoromethane

"Freon 113" = 1,1,2-Trichloro-1,2,2-trifluoroethane

"1,1,1-TCA" = 1,1,1-Trichloethane

"1,1,2-TCA" = 1,1,2-Trichloroethane

TABLE 7: SUMMARY OF CHEMICAL TEST RESULTS - WATER
2-PHASE™ Extraction Pilot Test
Hitachi GST
5600 Cottle Road, San Jose, California

Sample Name	Sample Date	Sample Time	Effluent Water Concentration (ug/L) [1, 2] Chloroform	Trichloroethene (TCE)	Comments
PT-EFF-06052007-1125	6/5/2007	11:25	150	1.8	Extracting from EW-5, EW-9, and EW-10
PT-EFF-06052007-1640	6/5/2007	16:40	130	1.6	Extracting from EW-5
PT-EFF-06062007-1505	6/6/2007	15:05	110	1.7	Extracting from EW-5
PT-EFF-06072007-1350	6/7/2007	13:50	100	1.5	Extracting from EW-5
PT-EFF-06072007-1640	6/7/2007	16:40	130	1.5	Extracting from EW-5, EW-9, and EW-10
PT-EFF-06082007-1640	6/8/2007	16:40	110	1.6	Extracting from EW-5, EW-9, and EW-10

Notes:

[1] Only componds detected in the effluent are shown.

[2] Samples analyzed by STL-San Francisco of Pleasanton, California by USEPA Method 8260B.

ug/L = micrograms per litre

TABLE 8: MASS REMOVAL ESTIMATE FOR VAPOR PHASE
2-PHASE™ Extraction Pilot Test
Hitachi GST
5600 Cottle Road, San Jose, California

Date/Time	Cumulative Run-Time (minutes)	Cumulative Vapor Volume (cubic feet)	Chloroform Concentration (ug/L)	Chloroform Mass Removed in Vapor[1] (grams)	Chloroform Mass Removed in Vapor (pounds)
6/4/07 13:00	0	0	--	0	0
6/9/07 11:05	365	9,183	34	7.8	0.017
6/5/07 14:00	540	14,511	26	4.5	0.010
6/5/07 16:40	700	17,760	39	3.0	0.007
6/6/07 7:00	1,560	33,498	24	14.0	0.031
6/6/07 11:30	1,830	38,565	26	3.6	0.008
6/6/07 15:05	1,940	40,583	24	1.4	0.003
6/6/07 18:05	2,120	43,985	24	2.3	0.005
6/7/07 8:05	2,955	59,349	22	10.0	0.022
6/7/07 12:05	3,195	63,789	23	2.8	0.006
6/7/07 13:50	3,300	65,815	19	1.2	0.003
6/7/07 16:40	3,470	69,771	23	2.4	0.005
6/8/07 8:30	4,420	101,596	17	18.0	0.040
6/8/07 16:40	4,910	117,586	16	7.5	0.016
6/9/07 9:28	5,938	151,416	16	15.3	0.034
		Total Chloroform Mass Removed in Vapor Phase During Pilot Test		**93.9**	**0.207**
		Chloroform Mass Removal Rate During Pilot Test (mass units per day)[2]		**22.8**	**0.050**

Notes:

[1] Mass removed is calculated from the average concentration and cumulative vapor volume over a given time interval according to the following generalized equation:

Mass Removed = $(C_1 + C_2)/2 * (V_2 - V_1)$

[2] The mass removal rate is calculated from the total pilot-test run-time and the total mass removed according to the following equation:

*Mass Removal Rate = Total Mass Removed / 5,938 minutes * 1,440 minutes/day*

ug/L = micrograms per litre

TABLE 9: MASS REMOVAL ESTIMATE FOR WATER PHASE
2-PHASE™ Extraction Pilot Test
Hitachi GST
5600 Cottle Road, San Jose, California

Date/Time	Cumulative Run-Time (minutes)	Cumulative Water Volume (gallons)	Chloroform Concentration (ug/L)	Chloroform Mass Removed in Water[1] (grams)	Chloroform Mass Removed in Water (pounds)
6/4/07 13:00	0	0	--	0	0
6/5/07 11:25	385	630	150	0.358	0.001
6/5/07 16:40	700	1,318	130	0.365	0.001
6/6/07 15:05	1,940	2,740	110	0.646	0.001
6/7/07 13:50	3,300	4,141	100	0.557	0.001
6/7/07 16:40	3,470	4,411	130	0.117	0.000
6/8/07 16:40	4,910	7,461	110	1.386	0.003
6/9/07 9:28	5,938	9,360	110	0.791	0.002
		Total Chloroform Mass Removed in Water Phase During Pilot Test		**4.2**	**0.009**
		Chloroform Mass Removal Rate During Pilot Test (mass units per day)[2]		**1.0**	**0.002**

Notes:

[1] Mass removed is calculated from the average concentration and cumulative water volume over a given time interval according to the following generalized equation:

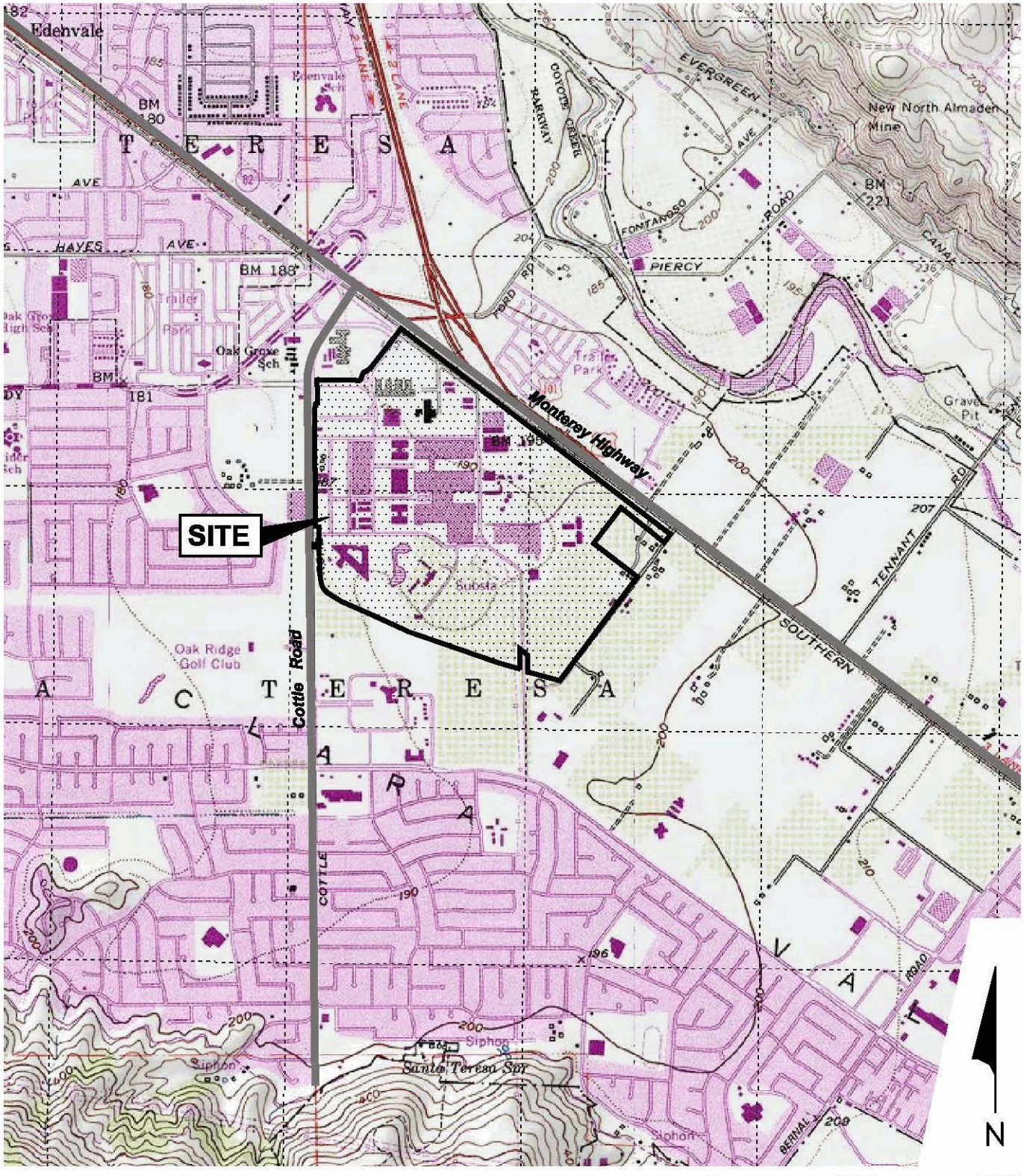
Mass Removed = $(C_1 + C_2)/2 * (V_2 - V_1)$

[2] The mass removal rate is calculated from the total pilot-test run-time and the total mass removed according to the following equation:

*Mass Removal Rate = Total Mass Removed / 5,938 minutes * 1,440 minutes/day*

ug/L = micrograms per litre

FIGURES



SOURCE: USGS Map 7.5 Min Series (Topographic) San Jose East QUAD, California, Photorevised 1980, National Geographic Topo 2001.

03111903E-VICMAP.DWG

ENVIRON

Site Location Map
Hitachi GST
San Jose, California

Figure
1

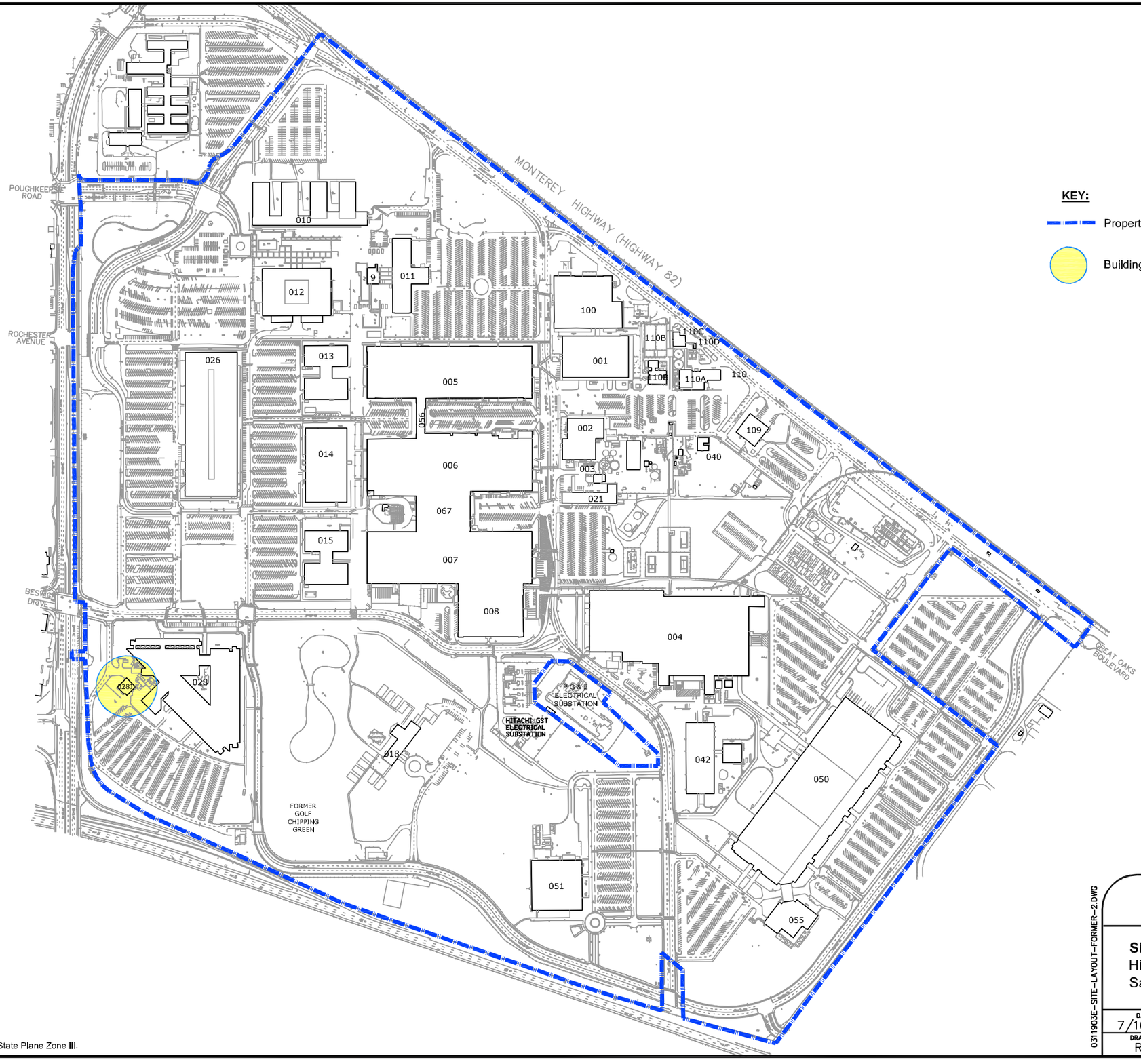
Drafter: RS | Date: 7/16/07 | Contract Number: 03-11903E | Approved: | Revised:

ENVIRON

Site and Surrounding Area
Hitachi GST
San Jose, California

Figure
2

Drafter: RS | Date: 7/16/07 | Contract Number: 03-11903E | Approved: | Revised:



KEY:

Property Boundary

Building 028J Area

N

0 500 1000

SCALE IN FEET

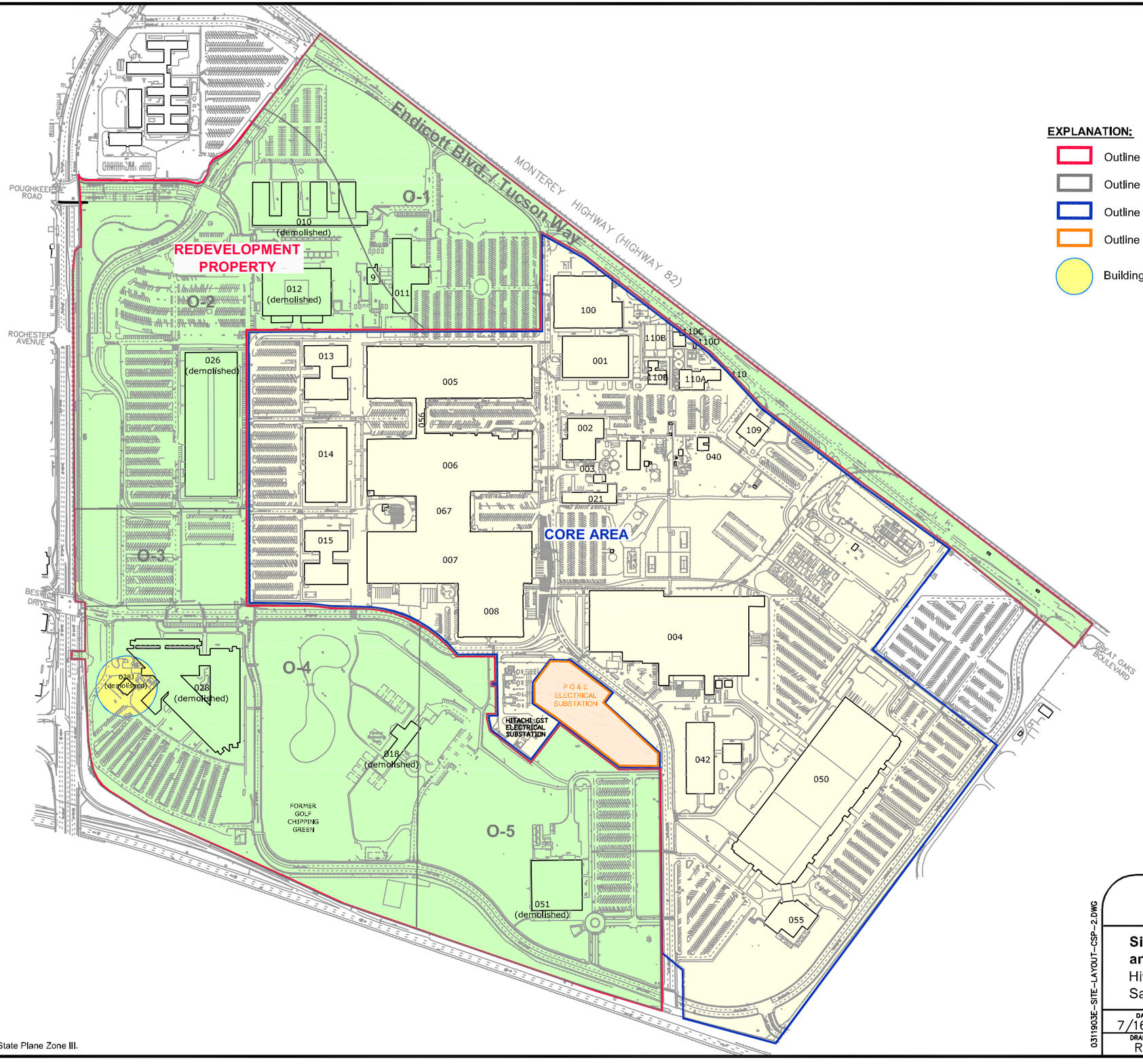
COORDINATE SYSTEM: California State Plane Zone III.

ENVIRON

Site Layout - Prior to Redevelopment
Hitachi GST
San Jose, California

DATE:	CONTRACT NUMBER:		FIGURE
7/16/07	03-11903E		3
DRAFTER: RS	APPROVED:	REVISED:	

03119035E-SITE-LAYOUT-FORMER-2.DWG



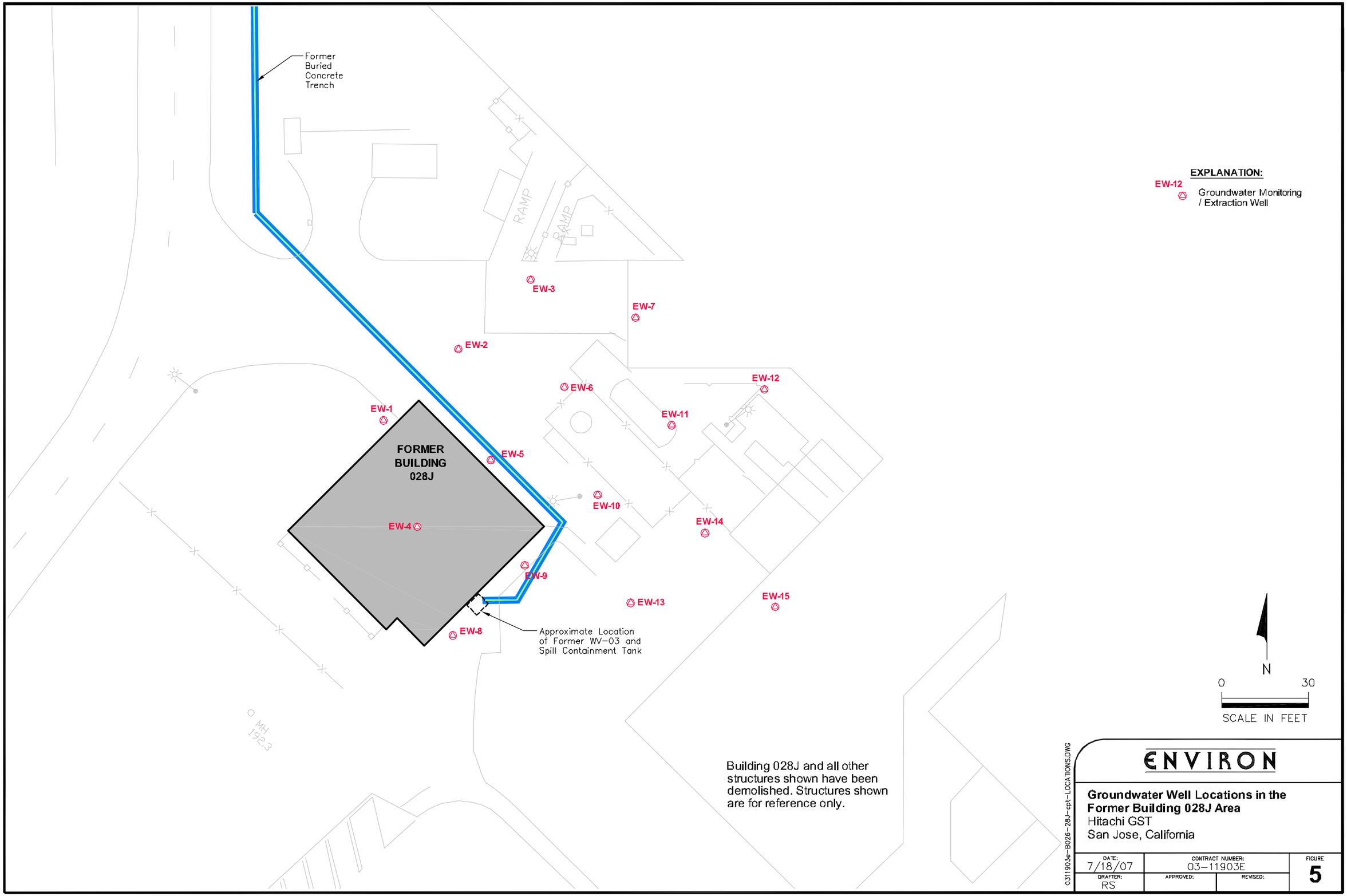
COORDINATE SYSTEM: California State Plane Zone III.

ENVIRON

Site Layout - Redevelopment Property and Core Area
Hitachi GST
San Jose, California

DATE:	CONTRACT NUMBER:		FIGURE
7/16/07	03-11903E		4
DRAFTER: RS	APPROVED:	REVISED:	

0311903E-SITE-LAYOUT-CSP-2.DWG


Former Buried Concrete Trench
RAMP
RAMP
EW-3
EW-7
EW-2
EW-6
EW-12
EW-1
EW-11
FORMER BUILDING 028J
EW-5
EW-10
EW-14
EW-4
EW-9
EW-13
EW-15
EW-8
Approximate Location of Former WV-03 and Spill Containment Tank
MH 1923
EXPLANATION:
EW-12
Groundwater Monitoring / Extraction Well
N
0
30
SCALE IN FEET
Building 028J and all other structures shown have been demolished. Structures shown are for reference only.
ENVIRON
Groundwater Well Locations in the Former Building 028J Area
Hitachi GST
San Jose, California
DATE: 7/18/07
CONTRACT NUMBER: 03-11903E
FIGURE 5
DRAFTER: RS
APPROVED:
REVISED:
0311903e-B026-28J-cpt-LOCATIONS.DWG

APPENDIX A

PHOTO LOG

Photo 1: View of former Building 028J area looking east.

Photo 2: Overview of extraction well field.

Title:	Site Photographs – 2-PHASE™ Extraction Pilot Test	**Date: June1-8, 2007**
Site:	Hitachi-GST San Jose, California	**Project-No.: 03-11903E** ENVIRON

Photo 3: View of extraction well field showing partial view of the manifold on the left side of the frame.

Photo 4: Overview of manifold (right), vacuum blower system (middle), and carbon adsorption vessels (left). One of two water storage tanks visible in background.

Title:	Site Photographs – 2-PHASE™ Extraction Pilot Test	**Date: June1-8, 2007**
Site:	Hitachi-GST San Jose, California	**Project-No.: 03-11903E** ENVIRON

Photo 5: Closer view of vacuum system and carbon adsorption vessels.

Photo 6: View of extraction manifold. Water storage tank in background.

Title:	Site Photographs – 2-PHASE™ Extraction Pilot Test	**Date: June1-8, 2007**
Site:	Hitachi-GST San Jose, California	**Project-No.: 03-11903E** ENVIRON

Photo 7: Close-up view of extraction manifold.

Photo 8: Side view of vacuum blower system.

Title:	Site Photographs – 2-PHASE™ Extraction Pilot Test	**Date: June1-8, 2007**
Site:	Hitachi-GST San Jose, California	**Project-No.: 03-11903E** ENVIRON

Photo 9: One of fifteen extraction wells protected by bollards.

Photo 10: Close-up view of well head. Window in pipe allows viewing of air/water ratio being extracted. White plug allows water level measurements. Valved sample port allows vacuum measurements.

Title:	Site Photographs – 2-PHASE™ Extraction Pilot Test	**Date: June1-8, 2007**
Site:	Hitachi-GST San Jose, California	**Project-No.: 03-11903E** ENVIRON

APPENDIX B

DAILY OPERATION LOG

Included below is a chronological summary of activities leading up to and including the 2-PHASE™ Extraction pilot test near former Building 028J:

- Wednesday May 30th through Friday June 1st – The well field and manifold were constructed by Drewelow Remediation Equipment, Inc. (DRE) under supervision of an ENVIRON Engineer. On Friday June 1st the wellheads were completed and the generator arrived at the Site. The system was tested for leaks and was declared ready for operation.
- Monday June 4th – Water levels were measured in all wells and all measurement devices were calibrated. Problems with the generator allowed only 130 minutes of runtime.
- Tuesday June 5th – A new generator arrived at the Site at 0630. At 0710 the system was started extracting from EW-5 with a blower vacuum of 18 inches of mercury (inches Hg). A stepped vacuum test was then initiated. At 0910 EW-9 was opened and blower vacuum dropped to 14 inches Hg. At 0920 EW-10 was opened and blower vacuum dropped to 12 inches Hg. At 0930 EW-4 was opened and blower vacuum dropped to 8 inches Hg. With four wells operating groundwater extraction was minimal, so three wells were deemed to be the maximum number of extraction wells that could be operated with the pilot test unit. Subsequently, wells were closed in reverse succession and samples of vapor and water were collected with three wells operating (EW5,9,10); with two wells operating (EW-5,9); and with one well operating (EW-5). At the end of the day only EW-5 was left operating to avoid overloading the vapor treatment carbon. Extra carbon was ordered for delivery the following day.
- Wednesday June 6th – The single well extraction test using EW-5 was continued. In general, with one extraction well running the blower vacuum ranges from 17-19 inches Hg and the vapor flow rate ranges from 16-19 cubic feet per minute (cfm) with the pilot-scale unit. The vacuum at the extraction wellhead ranges from 65-75 inches of water (inches H2O) and the groundwater extraction rate is approximately 1 gallon per minute (gpm). From 1215 to 1400, the system was shutdown to change out the carbon vessels. Representatives of DTSC arrived at approximately 1300 to view the system. The DTSC representatives were able to view all aspects of the system and witnessed the startup procedures following carbon change out. The single well test continued throughout the day and night.
- Thursday June 7th – At 0700 upon arrival at Site, water was visible in the bottom of the vapor line leading into the inlet of the first carbon vessel; however, it did not appear to have reached the carbon. The water was due to condensation from the humid vapor stream and the cold ambient temperatures the night before. The system was shutdown for five minutes to evacuate the water. Throughout the day condensation in the vapor stream made vapor concentration readings with a photoionization detector (PID) difficult. At 1515 EW-9 and EW-10 were opened to begin a three-well test to assess water table drawdown. These three wells were operated for the remaining duration of the pilot test. At the end of the day a total of

approximately 4,400 gallons of water had been extracted and discharged to the 6,900 gallon double-walled poly tank on-site. At 1800 the discharge was switched to the empty 6,500 gallon poly Baker tank to avoid overfilling.

- Friday June 8th – In general, with three wells operating the blower vacuum ranges from 10-12 inches Hg and the vapor flow rates range from 30-33 cfu. The vacuum at the extraction wellheads ranges from 30-50 inches H2O and the groundwater extraction rate is approximately 2.2 gpm.
- Saturday June 9th – Shutdown procedures began at 0740. At 0928 the blower was shutdown. Upon shutdown the water levels of the extraction wells were measured and the volume of water in the water tanks was calculated. The total pilot test runtime was approximately 99 hours. A total of approximately 9,360 gallons of groundwater was extracted and contained in the on-site water tanks.

APPENDIX C

LABORATORY ANALYTICAL REPORTS

Calscience Environmental Laboratories, Inc.

June 07, 2007

Chris Ritchie
ENVIRON
6001 Shellmound Street, Ste 700
Emeryville, CA 94608-1958

Subject: **Calscience Work Order No.: 07-06-0333**
Client Reference: Hitachi - GST / 03-11903E

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 6/6/2007 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Systems Manual, applicable standard operating procedures, and other related documentation. The original report of subcontracted analysis, if any, is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Ranjit K. F. Clarke

Calscience Environmental
Laboratories, Inc.
Ranjit Clarke
Project Manager

Calscience Environmental Laboratories, Inc.

ACCREDITED IN ACCORDANCE WITH nelac

Work Order Case Narrative

Project Name: **Hitachi - GST / 03-11903E**
Calscience Work Order Number(s): **07-06-0333**

On June 6, 2007, Calscience Environmental Laboratories, Inc. received three air samples associated with Hitachi - GST / 03-11903E. These samples are described in the accompanying chain of custody records. The laboratory sample receipt form immediately follows the corresponding chain of custody record.

The samples were received intact and chilled within the prescribed temperature preservation range. All samples and analyses were performed as requested on the accompanying chain of custody records. No anomalies were identified.

Calscience Environmental Laboratories, Inc.

Analytical Report

ENVIRON	Date Received:	06/06/07
6001 Shellmound Street, Ste 700	Work Order No:	07-06-0333
Emeryville, CA 94608-1958	Preparation:	N/A
	Method:	EPA TO-15
	Units:	ug/L

Project: Hitachi - GST / 03-11903E

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Instrument	Date Prepared	Date Analyzed	QC Batch ID
PT-C1IN-06052007-1105	**07-06-0333-1**	**06/05/07**	**Air**	**GC/MS V**	**N/A**	**06/06/07**	**070606L01**

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Acetone	0.028	0.019	4		t-1,3-Dichloropropene	ND	0.018	4	
Benzene	ND	0.0064	4		Ethyl-t-Butyl Ether (ETBE)	ND	0.033	4	
Benzyl Chloride	ND	0.021	4		Ethylbenzene	ND	0.0087	4	
Bromodichloromethane	ND	0.013	4		4-Ethyltoluene	ND	0.0098	4	
Bromoform	ND	0.021	4		Hexachloro-1,3-Butadiene	ND	0.043	4	
Bromomethane	ND	0.0078	4		2-Hexanone	ND	0.016	4	
2-Butanone	0.091	0.012	4		Methyl-t-Butyl Ether (MTBE)	ND	0.029	4	
Carbon Disulfide	0.015	0.0062	4		Methylene Chloride	ND	0.14	4	
Carbon Tetrachloride	0.064	0.013	4		4-Methyl-2-Pentanone	ND	0.016	4	
Chlorobenzene	ND	0.0092	4		o-Xylene	ND	0.0087	4	
Chloroethane	ND	0.0053	4		p/m-Xylene	ND	0.017	4	
Chloroform	34	2.0	800		Styrene	ND	0.017	4	
Chloromethane	ND	0.0041	4		Tert-Amyl-Methyl Ether (TAME)	ND	0.052	4	
Dibromochloromethane	ND	0.017	4		Tert-Butyl Alcohol (TBA)	ND	0.024	4	
Dichlorodifluoromethane	ND	0.0099	4		Tetrachloroethene	0.047	0.014	4	
Diisopropyl Ether (DIPE)	ND	0.033	4		Toluene	ND	0.0075	4	
1,1-Dichloroethane	0.030	0.0081	4		Trichloroethene	1.9	0.11	40	
1,1-Dichloroethene	0.32	0.0079	4		Trichlorofluoromethane	ND	0.022	4	
1,2-Dibromoethane	ND	0.015	4		1,1,2-Trichloro-1,2,2-Trifluoroethane	0.33	0.031	4	
Dichlorotetrafluoroethane	ND	0.056	4		1,1,1-Trichloroethane	0.85	0.011	4	
1,2-Dichlorobenzene	ND	0.012	4		1,1,2-Trichloroethane	ND	0.011	4	
1,2-Dichloroethane	ND	0.0081	4		1,3,5-Trimethylbenzene	ND	0.0098	4	
1,2-Dichloropropane	ND	0.0092	4		1,1,2,2-Tetrachloroethane	ND	0.028	4	
1,3-Dichlorobenzene	ND	0.012	4		1,2,4-Trimethylbenzene	ND	0.020	4	
1,4-Dichlorobenzene	ND	0.012	4		1,2,4-Trichlorobenzene	ND	0.030	4	
c-1,3-Dichloropropene	ND	0.0091	4		Vinyl Acetate	ND	0.014	4	
c-1,2-Dichloroethene	ND	0.0079	4		Vinyl Chloride	ND	0.0051	4	
t-1,2-Dichloroethene	ND	0.0079	4						

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
1,4-Bromofluorobenzene	92	57-129		1,2-Dichloroethane-d4	87	47-137	
Toluene-d8	85	78-156					

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

ENVIRON
6001 Shellmound Street, Ste 700
Emeryville, CA 94608-1958

Date Received: 06/06/07
Work Order No: 07-06-0333
Preparation: N/A
Method: EPA TO-15
Units: ug/L

Project: Hitachi - GST / 03-11903E

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Instrument	Date Prepared	Date Analyzed	QC Batch ID
PT-C1IN-06052007-1400	**07-06-0333-2**	**06/05/07**	**Air**	**GC/MS V**	**N/A**	**06/07/07**	**070606L01**

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Acetone	ND	0.19	40		t-1,3-Dichloropropene	ND	0.18	40	
Benzene	ND	0.064	40		Ethyl-t-Butyl Ether (ETBE)	ND	0.33	40	
Benzyl Chloride	ND	0.21	40		Ethylbenzene	ND	0.087	40	
Bromodichloromethane	ND	0.13	40		4-Ethyltoluene	ND	0.098	40	
Bromoform	ND	0.21	40		Hexachloro-1,3-Butadiene	ND	0.43	40	
Bromomethane	ND	0.078	40		2-Hexanone	ND	0.16	40	
2-Butanone	ND	0.12	40		Methyl-t-Butyl Ether (MTBE)	ND	0.29	40	
Carbon Disulfide	ND	0.062	40		Methylene Chloride	ND	1.4	40	
Carbon Tetrachloride	ND	0.13	40		4-Methyl-2-Pentanone	ND	0.16	40	
Chlorobenzene	ND	0.092	40		o-Xylene	ND	0.087	40	
Chloroethane	ND	0.053	40		p/m-Xylene	ND	0.17	40	
Chloroform	26	2.0	800		Styrene	ND	0.17	40	
Chloromethane	ND	0.041	40		Tert-Amyl-Methyl Ether (TAME)	ND	0.52	40	
Dibromochloromethane	ND	0.17	40		Tert-Butyl Alcohol (TBA)	ND	0.24	40	
Dichlorodifluoromethane	ND	0.099	40		Tetrachloroethene	ND	0.14	40	
Diisopropyl Ether (DIPE)	ND	0.33	40		Toluene	ND	0.075	40	
1,1-Dichloroethane	ND	0.081	40		Trichloroethene	1.9	0.11	40	
1,1-Dichloroethene	0.52	0.079	40		Trichlorofluoromethane	ND	0.22	40	
1,2-Dibromoethane	ND	0.15	40		1,1,2-Trichloro-1,2,2-Trifluoroethane	0.45	0.31	40	
Dichlorotetrafluoroethane	ND	0.56	40		1,1,1-Trichloroethane	1.1	0.11	40	
1,2-Dichlorobenzene	ND	0.12	40		1,1,2-Trichloroethane	ND	0.11	40	
1,2-Dichloroethane	ND	0.081	40		1,3,5-Trimethylbenzene	ND	0.098	40	
1,2-Dichloropropane	ND	0.092	40		1,1,2,2-Tetrachloroethane	ND	0.28	40	
1,3-Dichlorobenzene	ND	0.12	40		1,2,4-Trimethylbenzene	ND	0.20	40	
1,4-Dichlorobenzene	ND	0.12	40		1,2,4-Trichlorobenzene	ND	0.30	40	
c-1,3-Dichloropropene	ND	0.091	40		Vinyl Acetate	ND	0.14	40	
c-1,2-Dichloroethene	ND	0.079	40		Vinyl Chloride	ND	0.051	40	
t-1,2-Dichloroethene	ND	0.079	40						

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
1,4-Bromofluorobenzene	87	57-129		1,2-Dichloroethane-d4	95	47-137	
Toluene-d8	92	78-156					

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Analytical Report

ENVIRON	Date Received:	06/06/07
6001 Shellmound Street, Ste 700	Work Order No:	07-06-0333
Emeryville, CA 94608-1958	Preparation:	N/A
	Method:	EPA TO-15
	Units:	ug/L

Project: Hitachi - GST / 03-11903E

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Instrument	Date Prepared	Date Analyzed	QC Batch ID
PT-C1IN-06052007-1640	**07-06-0333-3**	**06/05/07**	**Air**	**GC/MS V**	**N/A**	**06/06/07**	**070606L01**

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Acetone	0.030	0.019	4		t-1,3-Dichloropropene	ND	0.018	4	
Benzene	ND	0.0064	4		Ethyl-t-Butyl Ether (ETBE)	ND	0.033	4	
Benzyl Chloride	ND	0.021	4		Ethylbenzene	ND	0.0087	4	
Bromodichloromethane	ND	0.013	4		4-Ethyltoluene	ND	0.0098	4	
Bromoform	ND	0.021	4		Hexachloro-1,3-Butadiene	ND	0.043	4	
Bromomethane	ND	0.0078	4		2-Hexanone	ND	0.016	4	
2-Butanone	0.046	0.012	4		Methyl-t-Butyl Ether (MTBE)	0.034	0.029	4	
Carbon Disulfide	0.015	0.0062	4		Methylene Chloride	ND	0.14	4	
Carbon Tetrachloride	0.13	0.013	4		4-Methyl-2-Pentanone	ND	0.016	4	
Chlorobenzene	ND	0.0092	4		o-Xylene	ND	0.0087	4	
Chloroethane	ND	0.0053	4		p/m-Xylene	ND	0.017	4	
Chloroform	39	2.0	800		Styrene	ND	0.017	4	
Chloromethane	ND	0.0041	4		Tert-Amyl-Methyl Ether (TAME)	ND	0.052	4	
Dibromochloromethane	ND	0.017	4		Tert-Butyl Alcohol (TBA)	ND	0.024	4	
Dichlorodifluoromethane	ND	0.0099	4		Tetrachloroethene	0.038	0.014	4	
Diisopropyl Ether (DIPE)	ND	0.033	4		Toluene	ND	0.0075	4	
1,1-Dichloroethane	0.052	0.0081	4		Trichloroethene	2.9	0.11	40	
1,1-Dichloroethene	0.58	0.0079	4		Trichlorofluoromethane	ND	0.022	4	
1,2-Dibromoethane	ND	0.015	4		1,1,2-Trichloro-1,2,2-Trifluoroethane	0.31	0.031	4	
Dichlorotetrafluoroethane	ND	0.056	4		1,1,1-Trichloroethane	1.8	0.11	40	
1,2-Dichlorobenzene	ND	0.012	4		1,1,2-Trichloroethane	ND	0.011	4	
1,2-Dichloroethane	ND	0.0081	4		1,3,5-Trimethylbenzene	ND	0.0098	4	
1,2-Dichloropropane	ND	0.0092	4		1,1,2,2-Tetrachloroethane	ND	0.028	4	
1,3-Dichlorobenzene	ND	0.012	4		1,2,4-Trimethylbenzene	ND	0.020	4	
1,4-Dichlorobenzene	ND	0.012	4		1,2,4-Trichlorobenzene	ND	0.030	4	
c-1,3-Dichloropropene	ND	0.0091	4		Vinyl Acetate	ND	0.014	4	
c-1,2-Dichloroethene	ND	0.0079	4		Vinyl Chloride	ND	0.0051	4	
t-1,2-Dichloroethene	ND	0.0079	4						

Surrogates:	REC (%)	Control Limits	Qual	Surrogates:	REC (%)	Control Limits	Qual
1,4-Bromofluorobenzene	89	57-129		1,2-Dichloroethane-d4	81	47-137	
Toluene-d8	89	78-156					

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers